

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

WASHINGTON, D. C.

Forest Insect Field Station

Forest Entomology

Refer to File

Coeur d'Alene, Idaho,

October 31, 1928.

G. C. B-11

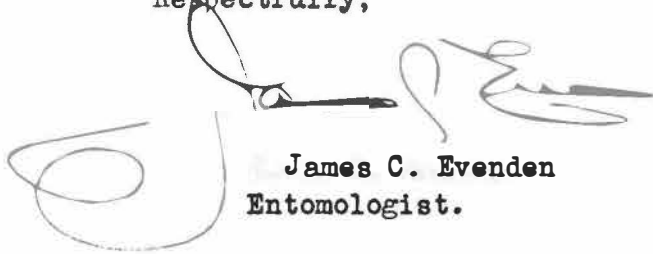
District Forester,
Forest Service Building,
Ogden, Utah.

Dear Sir:

Please find enclosed a copy of the final report of the 1928 survey of the Big Hole Basin insect control project, which I trust will meet with your satisfaction. You will note that in Conclusions of this report I have recommended that Proposal 3 be adopted, and that our entire efforts be directed towards the treating of all infested trees now existing on the Targhee and Madison Forests during the 1929 season, and that an adequate annual inspection be made of these areas for a number of years. It is sincerely trusted that you will be able to secure adequate funds for the control of all infested trees on the Targhee National Forest. It is hoped that during the 1929 season adequate provision can be made for the annual inspection of these areas.

I regret that during the past season I was unable to visit these areas as planned, but my entire time was required in other areas. However, with the inclusion of these regions into the plans for survey during the future, I shall, of course, have a far better knowledge of conditions than I have at this time.

Respectfully,



James C. Evenden
Entomologist.

1 enclosure

Report sent to: District Forester, Missoula
Dr. Craighead
Beaverhead Forest
Palo Alto Station

FINAL REPORT
OF THE 1928 SURVEY OF THE
BIG HOLE BASIN INSECT CONTROL PROJECT

INTRODUCTION

For the purpose of presenting advance information relative to the status of the mountain pine beetle infestation within the Big Hole Basin, Montana, a preliminary report was submitted under date of September 15. The survey of the area, which was under way at that time, was completed on October 10, and the purpose of this report is to show a complete analysis of the data secured. A financial report of the cost of this survey will not be included in this paper, but will be shown in the general report of the Big Hole Basin control project for 1928, which will be prepared by C. S. Webb and the writer at a later date.

As a matter of convenience to the readers, this paper has been prepared as a complete report and not as a supplement to the preliminary discussion of September 15. In the adoption of this plan it will be necessary to cover a great deal of the same ground previously discussed, but no reference will be made to the preliminary report. Though there are but few material changes in

the general data relative to the amount of infestation, as shown by the preliminary report, some of these are of importance in considering the future of the project.

In considering the advisability of continuing control work within this area another season, there are two important factors which must be carefully considered. The first of these is the source of the reinfestation which is occurring annually within the Big Hole Basin. It is known that the plan under which this project has been operated is called a barrier plan of control. In the execution of such a plan as it applied to this project, the Big Hole Basin was adopted as a zone of defense in which all infested trees were to be treated each year until reinfestation no longer occurred. No estimate could be made as to the number of years control measures would be necessary, as it was governed entirely by the extent of the beetle supply which was present in the severe epidemic on the East Fork of the Bitterroot River. The second factor to be considered in all future thoughts of this project is the epidemic of the mountain pine beetle in the lodgepole pine stands of the Salmon National Forest, Idaho. The seriousness of this epidemic, and that there were heavy blocks of infested trees on the Wimpey Creek drainage, which is just over the Continental Divide from the head of the Big Hole Basin, were known during the 1927 season. However, at that time it was not definitely known that the beetles had started to cross the Continental Divide into the Beaverhead National Forest,

so its seriousness was not given the consideration which it warranted. At this time there can be no doubt but that the insects are crossing into the Beaverhead Forest from the Salmon as well as the Bitterroot.

It is imperative that the readers of this report secure a full understanding of the seriousness of the entire situation, in order that proper action can be taken in the future. With this realization an attempt has been made to present the situation in the same light as viewed by the writer, in the hope that the reader could visualize the actual conditions as they now exist. Following this idea rather detailed discussions of the many factors which enter into the thoughts of continuing this project are included within this report.

It is realized that many readers will secure an impression that the findings of the recent survey have been surprisingly discouraging. Though discouraging, the results secured were not a surprise. It was hoped that a marked reduction would follow the 1928 control work, but a heavy flight of beetles from the Bitterroot was expected and feared. The situation as it now exists and its occurrence, with the exception of the infestation to the south, has been foreseen and predicted in all previous reports. The data secured from the units south of the Big Hole Basin were surprisingly discouraging, and can only be accounted for through a flight of beetles from the Salmon infestation.

Reference is made to the map accompanying this report on which the various units have been designated. Descriptions of these units were given in the preliminary report of September 15, 1928.

TABLE OF UNITS

Unit	ACRES : <u>1926</u>	TREES: <u>1927</u>	TREES: <u>1928</u>	<u>INCREASE</u>
Pintlar	21,760	18,278	5,440	236%
Mussigbrod	20,480	43,827	7,168	511%
Battlefield	37,120	28,582	3,712	669%
West Side	33,280	22,297	1,996	1017%
Jackson	28,160	24,217	3,097	682%
Bloody Dick	61,440	29,491	6,144	380%
Horse Prairie	24,320	11,673	5,836	100%
Battlesnake	48,000	2,592		2592%
Grasshopper	41,600	540	540	---
Warm Springs	51,200	18,944	1,024	1750%
East Side	49,280	32,524	8,870	266%
Upper Wise River	144,000	9,504	2,160	340%
Lower Wise River	61,440	6,328	614	931%

BITTERROOT EPIDEMIC

As the probable life of the Bitterroot epidemic is the most important factor to consider in future thoughts of control within the Big Hole Basin, a rather detailed discussion of the present status of this infestation follows. This outbreak of the mountain pine beetle, which for several years has existed on the East Fork of the Bitterroot, has been spreading in much the same manner as a tremendous fire. The solid blocks of infestation move steadily forward each year, with new spots of infestation being thrown into new uninfested areas. The distance which these spots appear in advance of the main body may vary from a few to many miles. The movement of the main body of the epidemic is relatively slow, but the advance spots of infestation soon build into heavy blocks of infestation, which in reality makes the advance seem very rapid.

At the time the Big Hole Basin project was started it was recognized that its success depended entirely upon the direction in which the main force of the Bitterroot epidemic traveled. It was hoped that the main advance would be away from the Big Hole Basin and that which did cross the Continental Divide would be but a rolling over or sidewash from the main spread of the epidemic. It was believed that in the event of such an occurrence there would be a fair chance of holding the Big Hole Basin against the southern

spread of the epidemic. On the other hand, it was realized that if the entire force of the advance, or a major portion of it, did spread into the zone of defense the chances of success would be eliminated.

Though the advance of the Bitterroot epidemic has been divided and is now spreading to the north as well as to the south, that portion crossing the Continental Divide into the Big Hole Basin is still of an enormous magnitude. The northern spread of the Bitterroot epidemic has swept through the Bertie Lord, Moose, and Martin Creek drainages into the Rock Creek watershed of the Missoula National Forest, where an extremely heavy 1927 attack occurred. To the south the epidemic has advanced steadily along the west side of the Continental Divide, with heavy flights of beetles into the Big Hole Basin during the 1926 and 1928 seasons. The Mink and Springer Creek drainages of the Bitterroot now appear as solid blocks of infestation, while during the past season the attack on the heads of Tolan and Meadow Creeks has been very heavy. In the areas where the infestation has been present for a number of years, there are still thousands of trees being attacked annually. These trees are the smaller ones left at the time the epidemic is at its height within the areas, but which are subsequently taken by the beetles during the mopping-up process which occurs in the rear of such epidemics.

Along the west side of the Continental Divide there are large areas of mature pine capable of maintaining a severe epidemic of the mountain pine beetle for several years. This is practically the first year that the insects have been active in the timber stands near the crest of the Divide, but during the past season thousands of trees were attacked. To determine the status of the 1928 attack in these areas a survey was made of some 19,000 acres on the heads of Tolan and Meadow Creeks. The data secured from this survey showed that there was an average of 15.6 newly-attacked trees per acre, or some 300,000 for the total acreage covered. Next season the infestation in these areas will be a great deal heavier, and, with a favorable season, larger and longer flights of beetles into the Big Hole Basin will occur.

Even with the information available it is very difficult to accurately foresee the life of the Bitterroot epidemic. It would be safe to say that there is sufficient timber remaining to carry a severe epidemic for at least five more years.

SALMON INFESTATION

At this time the severe outbreak of the mountain pine beetle on the Salmon National Forest, and other Idaho forests adjacent, can no longer be disregarded in future plans of control. It is reasonable to assume that the infestation within the southern portion of the Beaverhead Forest came from this epidemic. The number

of years which this epidemic will continue to act as a source of supply for the reinfestation of the southern units of the Beaverhead is, of course, unknown. It is safe to say, however, that in that portion of the Salmon Forest lying along the west side of the Continental Divide there is sufficient timber remaining to maintain a severe epidemic for 5 or 6 years at least. To continue control operations within the Big Hole Basin, in the hope of checking the southern spread of the Bitterroot epidemic, and to disregard the outbreak in the units ahead of the zone of defense, would be an extremely untenable position.

DISCUSSION OF CONDITIONS AS REVEALED BY THE 1928 SURVEY

In 1927 the data secured from a survey of the Big Hole Basin indicated that there were some 65,000 infested trees on the different areas which should be covered by control work. Though this figure was fairly well substantiated by the 1928 control operation, it was very evident that it was entirely too conservative. As a result of the 1928 survey we find that there are some 203,477 newly-attacked trees within the Big Hole Basin as against 65,000 for last year, and a total of 248,797 for the Beaverhead National Forest.

As it is understood that the primary objective of this project is the prevention of the southern spread of the epidemic, rather than the protection of the timber within the Big Hole Basin, it is, of course, necessary to include all of the infested areas ahead of the

main infestation in any plan of control. Therefore, in any future thought of control for the Big Hole Basin, it will be absolutely necessary to include the Warm Springs, Rattlesnake, Grasshopper, Bloody Dick, and Horse Prairie units, in the plan of operation. Such a plan would mean the treatment of some 248,797 infested trees, which are spread over an area of 622,080 acres. Though such a project is not an impossibility, it would seem that the man-power which would be necessary, as well as the expense of the operation, would make it an uneconomical undertaking.

To treat this number of trees in the same manner as practiced last season would require an allotment of at least \$400,000 and a force of some 1,500 to 2,000 men. It is possible that a less expensive method of control could be adopted, if the welfare of the green, uninfested trees adjacent to those treated could be disregarded. Efficient equipment could no doubt be developed by which standing infested trees could be sprayed and burned at a reasonably low cost. Groups of infested trees could be felled into windrows, or piles, and burned without the expense of skidding and decking the logs. Though in the use of such methods the cost of control would undoubtedly be reduced, there are two other factors to be considered in its adoption. The first of these would be the injury to the young uninfested trees which are left by the epidemic, and upon which we are obliged to depend for the second stocking of the area. Unless there

was a strong possibility of checking future depredations by the insects, such an operation would only increase the damage to the area, which in this instance would be the case within the Big Hole Basin. The second factor to be considered in the adoption of such a plan of control would be the climatic conditions under which one is obliged to work in this region. During the 1928 control season such methods could have been used successfully, but in 1927 there would have been weeks at a time when their use would have been impossible. Strong winds make the burning of standing trees very difficult, while snowstorms prohibit such methods. Regardless of the method of control adopted, in planning future control for this region, one is obliged to look beyond the 1929 season, for the continuation of the present project will result in the expenditure of large sums of money over an indefinite number of years, with no guarantee of success.

In planning for the 1929 season we have as an alternative to the expenditure of such a large sum of money the possibility of once more giving ground and establishing a new zone of defense, which to the writer would appear only as a reprieve from the inevitable. The only feasible location for the establishment of such a new zone would be that portion of the Beaverhead Forest lying to the south of the Big Hole Basin, or the head of the Beaverhead River drainage. In this proposed zone of defense the timber stands are more scattered,

though there are some rather large bodies of mature pine, and the acreage is much smaller. The survey data from this region show that there are some 45,320 newly-infested trees extending over an area of some 175,000 acres. It is possible that this zone could be held for a number of years, but no assurance could be given that by the time the heavy blocks of infestation approach, which will happen if the epidemic continues, that the available host material would not be totally destroyed, and the insects forced to spread to the adjacent timber stands.

In considering the thoughts of control for any outbreak of the mountain pine beetle in lodgepole pine, cognizance must be taken of the fact that such epidemics do spread, and that the advance is not the rather slow movement of the heavy centers, but by somewhat long flights of insects into new areas, which serve as nuclei for the development of new centers of infestations. The maximum distance of such flights is not known, but the writer feels safe in stating that under favorable conditions a barrier of 15 miles would not be effective as a check to the spread of such epidemics as we are now combating. It is not intended to give an impression that these insects will always cross a 15-mile barrier, but with favorable brood development and proper climatic conditions, the writer feels that such a flight is easily possible.

RECOMMENDATIONS

In offering recommendations for the future consideration of this project the writer feels that his task lies in presenting the entomological possibilities as seen from our present knowledge of the situation. It would seem that there are only three courses which could be adopted in considering the future of this project, which are as follows:

First Proposal

Continuation of the present plan of control with the addition of the Warm Springs, Rattlesnake, Grasshopper, Bloody Dick, and Horse Prairie units to the present zone of defense.

Second Proposal

Abandonment of the present zone of defense and the adoption of the new one, as shown on the attached map.

Third Proposal

Abandonment of the project within the Beaverhead National Forest, with careful observation and prompt action to check any outbreaks occurring within the Targhee and Madison Forests.

A discussion of the entomological status of these three proposals follows.

First Proposal

To continue control operations within the Big Hole Basin and disregard the units to the south would be an extremely untenable position, and entomologically unsound. It is possible that if all

of the infested trees within the area as outlined could be treated for a number of years, the southern and eastern spread of these two epidemics might be prevented. However, no guarantee of success could be given, which together with the physical and economical factors make the thoughts of continuing this plan nearly prohibitive. The number of years it would be necessary to continue this project is, of course, rather problematical. Control work would be necessary as long as reinfestation from the Bitterroot and Salmon infestations occurred, which could safely be estimated to be from five to seven years at least. The future cost of the project is likewise uncertain. However, one could be assured that with the heavy centers of the Bitterroot and Salmon epidemic approaching the crest of the Continental Divide, for the next three or four years the reinfestation will be far heavier than in the past. It is estimated that some \$400,000 would be required for the continuation of this project during the 1929 season, and the writer again feels safe in stating that a far larger sum will be required in 1930.

If the question of funds could be eliminated from this discussion, it is doubted if it would be physically possible to hold the area against the heavy infestation which we have a right to expect for the next few years. The total acreage of the area is tremendous, and with the development of such heavy centers as are found on the Bitterroot and Salmon, where it is not uncommon to find

as many as 50,000 newly-attacked trees per section, the total manpower would be nearly impossible to secure or to administrate.

The only entomological advantages of this plan would be the reaping of benefits already secured from previous control work, and the fact that there would seem to be sufficient timber within the area to catch or hold all of the insects which might spread from the Bitterroot or Salmon. However, these advantages are more than counterbalanced by the unfavorable physical and economic factors which enter into the problem.

Second Proposal

The only advantage of this plan is that it offers a smaller acreage with scattered timber stands, and at this time a much smaller number of trees to treat. Unfortunately the objections to it make it entomologically unsound. A rather uncertain objection is the fact that the area does not support sufficient timber to catch or hold all of the infestation which will undoubtedly come into the area if the Bitterroot and Salmon infestations continue. In the event of such an occurrence, the invading insects will either starve for want of host material, or they will migrate into new uninfested area. It is true, of course, that if all the timber within this proposed zone of defense were destroyed, a much wider barrier than that now existing between the Beaverhead and Madison Forests would be established. The advantage of this fact as an argument for the adoption of the plan of control is very questionable.

The proposed zone of defense, as shown on the attached map, should be extended so as to include that portion of the Beaverhead Forest directly to the north of the Battlesnake and to the east of the Wise River units. Though there is but very little pine in this region, it would be necessary to make some effort to prevent the infestation within the Wise River units from spreading eastward into the Madison Forest. It would seem that there is equally as much danger of the infestation spreading from these units as there is from those to the south. It is true that there is a rather wide barren barrier between the northern portions of the Beaverhead and the Madison Forests, but it is believed that between the southern portions of these two forests a barrier exists which is equally as wide. The effectiveness of this barrier is, of course, unknown, and no assurance can be given that the insects will, or will not, spread from the Beaverhead into the Madison. Regardless of this uncertainty the writer believes that the prosecution of this plan will have but very little, if any, effect upon the spread of the insects across this barrier, if conditions are favorable for such a flight.

Third Proposal

In the adoption of this proposal, advantage would be taken of the possible protection offered by the rather wide barriers of open country which lie between the Beaverhead Forest and the regions toward which protection is directed, over which we are not sure the insects will cross. Furthermore, it is possible that should the

insects cross this open country, it would only occur under very favorable conditions for such a flight, and the full force of the epidemic would perhaps never be felt in these eastern areas.

This proposal, in addition to recommending the cessation of control work within the Beaverhead Forest, carries with it the need for a careful inspection of all pine stands within the forests to the south and east for a period of several years. An intensive program of control should be adopted and maintained within these areas for the next 6 or 8 years. All infested trees located during the annual inspection should be regarded as potential epidemics and promptly treated.

CONCLUSIONS

In summing up the advantages of the three proposals offered, it would seem that the infestation which already exists within the Targhee National Forest must be taken into consideration. Regardless of the source of this infestation, it is already within the areas towards which protection has been directed, and should receive first consideration.

The writer feels that to recommend the continuation of our present plan of control, as outlined under the first proposal, even on a strictly experimental basis, would, with our present knowledge, be a very untenable position. The cost of the project for 1929, with the assurance that this cost will be increased for the next few years, with the very small chance of success which is

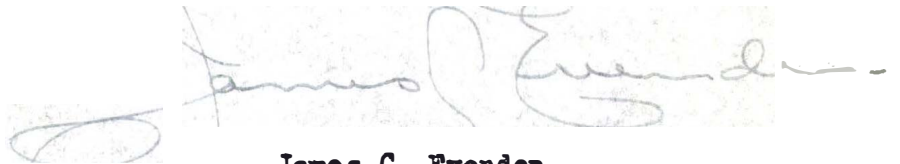
offered, makes the first proposal an extremely unsound one. In taking this position it is regretted that it does not seem feasible to take any action towards the protection of the timber stands within the Big Hole Basin. It is recognized that this timber has a commercial value, but with the Bitterroot epidemic spreading into the area as it is, it is doubted if control work would contribute towards the protection of more than a very small per cent of it.

The second proposal offers a more economical undertaking, but its entomological success is even more uncertain than the present plan. The only justification for the adoption of this plan would be to attempt to hold the proposed new zone of defense for a few years in the hope that the epidemics would be reduced through natural agencies. This would be very much of a gamble and would hardly justify the adoption of the plan.

Under existing circumstances it is believed that the only plan of control which can be adopted as a means of protecting the timber stands of the Madison, Targhee, and Yellowstone Park, is the one offered under Proposal 3. This plan takes advantage of what must at least be a partial barrier to the spread of the insects. In the event of the beetles crossing this assumed barrier, which is very possible, the control measures instituted would be for the purpose of destroying only those insects which were successful in crossing, instead of trying to prevent all insects from attempting to cross.

It is therefore recommended that Proposal 3 be adopted and that our entire efforts be directed towards the treating of all groups of infested trees now existing on the Targhee and Madison Forests during the 1929 season, and that an adequate annual inspection be made of these areas for a number of years. This inspection should be made as intensive as the situation demands, and so that all infested trees can be treated promptly.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "James C. Evenden", is written over a light-colored rectangular stamp. To the left of the signature is a small, faint circular mark.

James C. Evenden
Entomologist

